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INDOOR SWITCHBOARD ANCHOR CALCULATIONS REPORT

Rev.0

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JUNE, 2026

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INDOOR SWITCHBOARD ANCHOR CALCULATIONS REPORT
JUNE, 2026
[REDACTED]
SWITCHBOARDS SEISMIC COEFFICIENTS - CH.13

Seismic Coefficient Calculations For Bolts/Anchor Bolts (CBC 2019 / IBC 2018)

Component Amplification Factor (ap)= 2.5
Component Response Modification Factor(Rp)= 6

ASCE-7-16 Table 13.6-1
ASCE-7-16 Table 13.6-1

SMS = 2.264 g
SDS = 1.509 g
Seismic Importance Factor (Ip) = 1.5
Height of attachment in the Structure (hx) = 0
Height of the Structure (hr) = 1

Given data
Given data

Floor 1

Ch = (.4apSDS Ip/Rp)(1 + 2hx/hr) = 0.38

Chmax = 1.6SDS Ip = 3.62

Chmin = 0.3SDS Ip = 0.68

Controls

Cvn = 0.2SDS = 0.30

Over Strength Factor (Ω) = 2

Attached to concrete

Ch = 0.68

Cv = 0.30

Anchor Locations									W	Fpv	Fp	Fp	Case 5	Case 7
	X'	Xcg	Xcg^2	Y'	Ycg	Ycg^2	r	r^2	Tension	Tension	Tension	Shear	Tension	Tension
A1	3.72	-89.65	8036.67	17.28	17.28	298.60	91.30	8335.27	317.28	95.75	451.83	443.31	1380.15	1093.46
A2	173.28	79.91	6386.01	17.28	17.28	298.60	81.76	6684.61	502.11	151.54	795.55	670.85	2345.18	1891.47
A3	3.72	-89.65	8036.67	-17.28	-17.28	298.60	91.30	8335.27	317.28	95.75	-815.29	443.31	-1154.09	-1440.78
A4	173.28	79.91	6386.01	-17.28	-17.28	298.60	81.76	6684.61	502.11	151.54	-471.57	670.85	-189.06	-642.77
A5	45.13	-48.24	2326.86	17.28	17.28	298.60	51.24	2625.45	362.42	109.38	535.78	498.88	1615.83	1288.35
A6	50.85	-42.52	1807.74	17.28	17.28	298.60	45.89	2106.34	368.65	111.26	547.37	506.56	1648.38	1315.27
A7	93.13	-0.24	0.06	17.28	17.28	298.60	17.28	298.65	414.74	125.17	633.08	563.29	1889.01	1514.25
A8	98.85	5.48	30.06	17.28	17.28	298.60	18.13	328.66	420.98	127.05	644.67	570.97	1921.57	1541.17
A9	138.13	44.76	2003.68	17.28	17.28	298.60	47.98	2302.28	463.79	139.97	724.30	623.68	2145.12	1726.04
A10	143.85	50.48	2548.48	17.28	17.28	298.60	53.36	2847.08	470.03	141.85	735.89	631.35	2177.68	1752.96
A11	45.13	-48.24	2326.86	-17.28	-17.28	298.60	51.24	2625.45	362.42	109.38	-731.34	498.88	-918.41	-1245.89
A12	50.85	-42.52	1807.74	-17.28	-17.28	298.60	45.89	2106.34	368.65	111.26	-719.75	506.56	-885.85	-1218.97
A13	93.13	-0.24	0.06	-17.28	-17.28	298.60	17.28	298.65	414.74	125.17	-634.04	563.29	-645.22	-1019.98
A14	98.85	5.48	30.06	-17.28	-17.28	298.60	18.13	328.66	420.98	127.05	-622.45	570.97	-612.67	-993.06
A15	138.13	44.76	2003.68	-17.28	-17.28	298.60	47.98	2302.28	463.79	139.97	-542.82	623.68	-389.11	-808.20
A16	143.85	50.48	2548.48	-17.28	-17.28	298.60	53.36	2847.08	470.03	141.85	-531.22	631.35	-356.56	-781.28
SUM	1493.88		46279.11	0.00		4777.57		51056.68	6640.00	2003.95	0.00	9017.78	9971.95	3972.05
MAX									502.11	151.54	795.55	670.85	2345.18	1891.47
MIN									317.28	95.75	-815.29	443.31	-1154.09	-1440.78

X¹_Wcg=85.77 Inch

Y¹_Wcg=0.00 Inch

X¹_Acg=sum(x1)/N=93.37 Inch

Y¹_Acg=sum(y1)/N=0.00 Inch

Ex=X1_Acg-X1_Wcg=7.60 Inch

Ey=Y1_Acg-Y1_Wcg=0.00 Inch

Calcs of Lateral Load critical angle

lxx=sum(Ycg^2)=4777.57 Inch²

lyy=sum(Xcg^2)=46279.11 Inch²

$$\theta = \tan^{-1}\left(\frac{I_{xx} * X_{cgl}}{I_{yy} * Y_{cgl}}\right) = 28.17$$

Calcs of Lateral Tension on Anchors

(1.2+0.2Sds)W+QE

(0.9-0.2Sds)W+QE

Tension due to Eccentricity

$$T_e = W_{max} \left(\frac{Y_{cgl} * E_y}{I_{xx}} + \frac{X_{cgl} * E_x}{I_{yy}} \right)$$

Tension due to Lateral turning over

$$T_o = \frac{W - F_{pv}}{N} - \frac{F_p * \cos(\theta) * H_{cg} * Y_{cgl}}{I_{xx}} - \frac{F_p * \sin(\theta) * H_{cg} * X_{cgl}}{I_{yy}}$$

Calcs of Lateral Shear and Tension Loads

Shear due to Eccentricity

Mr(ECCENTRIC MOMENT)=Fp*sqrt(Ex^2+Ey^2)=34256.307 lb.inch

Vrot=Mr*x_max/sum(r^2)=60.15 lb

Direct Shear

Vd=Fp/N=281.81 lb

Anchor Max Loads

Max LFRD Tension(Tt)= -1,440.78 lb

Max ASD Tension (Teff)=Tt/1.4= -1,029.13 lb

Max LFRD Compression (Ct)= 2,345.18 lb

Max ASD Compression (Ceff)=Ct/1.4= 1,675.13 lb

Max LRFD Shear(Vt)= 670.85 lb

Max ASD Shear (Veff)=Vt/1.4= 479.18 lb

Anchor Check

Use Minimum 16 A.BOLT 0.75-inch DiameterKwik Bolt TZ2 - SS 304 with 4.75-inch Embedment and 7" Edge Distance

fc'=4,000 psi

Special Inspection: YES

Min Concrete Depth: 12"

See Hilti Attached Report

Equipment and Lateral Load Data

Eq. Weight (W in lb)=	6,640		
Ω=	2	Ch=	0.68
Hcg=	44.07	Cv=	0.30
B=	34.56	Fp=	4,508.89
L=	169.56	Fpv=	2,003.95
N Ancr/Wld=	16	Bolt size =	3/4

Note:
Y1_Wcg is assumed at 1/2 L

Bolt Tension

Bolt Shear (x 2 Considering the Impact effect due to oversized switchboard holes)

Shear = 1341.69 lb

Notes:

1- Anchors material recommendation is HDG-B7 or SS for outdoor applications and Zinc-coated CS for indoor applications unless specified above.

2- Seismic design of the equipment, the supporting steel or the concrete foundation are done by others and are not in the scope of this calculation.

3- The Center of Gravity, Dimensions and weights are provided by the Customer.